Topic: N14A-T008

Mayachitra, Inc.

Object Cueing Using Biomimetic Approaches to Visual Information Processing
Human ability to search for objects in visual scenes is unsurpassed by current automated techniques. Performance of overhead sensor data state-of-art region saliency and object recognition is degraded by low resolution data quality, object-of-interest size, view occlusions, and crowded scenes. To successfully detect objects in cluttered scenes, the human brain relies on multiple factors: prior object occurrence probability, global scene statistics, and object co-occurrence. Mayachitra's proposed solution provides efficient and effective small object detection from overhead noisy (crowded occluded) videos. The proposed technology enables collection speed data labeling, and intelligence mining. Benefits are multi-tiered: analyst time is optimized through reduction/elimination of mundane viewing tasks; multiple search, tagging, discover, data access and analysis capabilities are provided; intelligence is derived and verified in a fraction of time; and no data is thrown away providing analysts the capability to explore archival data.

Technology Category Alignment:
Fixed Wing Vehicles (includes UAS)
Machine Perception, Reasoning and Intelligence
Command, Control, Communications, Computers, & Intelligence (C4I)
System Interfaces & Cognitive Processes
Electro-Optical/Infrared (EO/IR)

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SYSCOM: NAVAIR
Contract: N68335-16-C-0028

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-16-C-0028

Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-281

Transition Target: PMA-281's Common Control System (CCS) for Unmanned Systems implements a software and user interface architecture that provides common vehicle management, mission planning and mission management capabilities for all future Navy unmanned air vehicles (UAVs), including unmanned air systems (UAS). Mayachitra's advanced visual information processing capabilities are targeted for early adoption and integration into the CCS architecture.

TPOC:
(301)757-8491

Other transition opportunities: All programs that fly UAS and collect electro-optical (EO) sensor video data. Potential transition candidates include: NAVAIR's Persistent Maritime Unmanned Aircraft Systems' (UAS) (PMA-262) MC-4Q Triton, NAVAIR's (PMA- 265) F/A-18 Hornet Strike Fighter, the Joint Strike Fighter (JSF) program, and the Naval Air Weapons Station (NAWS) China Lake.
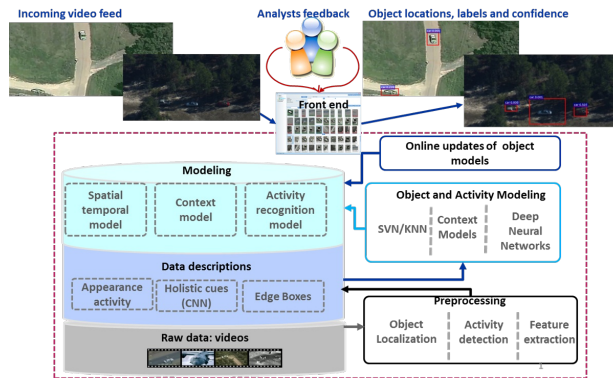
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WHAT

Operational Need and Improvement: Employment of advanced automated and semi-automated techniques enables enhanced identification opportunities from useful unseen data, and provides support to task saturated intelligence officers and staff. Future operations will require faster, more accurate methods to assess visual data that combine traditional human evaluation and automated techniques. Low resolution quality of operational data, size of objects of interest, view occlusions, and crowded scenes degrade the performance of state-of-art region saliency and object recognition approaches applied to overhead sensor data.

Specifications Required: Automatically detect and recognize multitude of objects of potential interest providing an object recognition decision with a high level of confidence -- it is critical to understand the performance and performance evaluation; to perform object recognition/cueing in real to near-real time on medium to high-end desktop computers.

Technology Developed: Mayachitra has developed technology to automatically detect and recognize objects of potential interest from overhead video and sensor imagery, which provides object recognition decision with a high level of confidence. Efficient and effective object recognition is performed in real to near-real time and can be executed on low size, weight, and power (SWaP) UAS processors. Mayachitra's technology employs state-of-art deep learning and bio-inspired methods to efficiently and effectively detect small objects from overhead noisy (crowded occluded) videos, where state-of-art models fail. The technology integrates a suite of the support modules to enhance user interaction.

Warfighter Value: Reduction in un-evaluated data from sensors used due to lack of resources required to evaluate the data collected. Reduction in workload for intelligence officers and their staff. Higher hit rate on targets of interest and less false alarms on innocuous or friendly objects. Tasks processed on the platform to reduce data smog.

WHEN

Contract Number: N68335-16-C-0028 **Ending on:** April 11, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Optimize the architecture design of the deep learning network to support small object recognition in crowded overhead videos.	Low	Prototype demonstration with relevant data sets	6	November 2016
Object recognition at multiple levels of description.	Low	Average precision	6	April 2017
Tune the modeling pipeline to meet precision-recall demands	Med	Average precision	6	April 2017

HOW

Projected Business Model: Mayachitra's is initially focused on the Department of Defense (DoD) Navy, Airforce, and Marine Corps to support technology transfer through sales, support contracts, and licensing agreements.

Company Objectives: Mayachitra's technology automatically detects and recognizes multitudes of objects of potential interest providing a high confidence, near real time, object recognition decision capability for processed EO/IR sensor imagery. In today's environment warfighters are faced with an exponential increase in available overhead video sensor data. Based upon changes in the battlefields many different types of pre-mission objects of interest are anticipated – the proposed technologies' active learning component provides operators the capability to find objects of interest in real time given various operating environmental parameters, backgrounds, clutter, weather, etc. Mayachitra's primary objective is to connect its technology with interested PMAs and NAVAIR Labs, to mature capabilities under technology insertion initiatives, adapt the capability to meet the needs of the greater UAS community, and deploy the capability through Navy program of record to support theater operations.

Potential Commercial Applications: This technology would be useful for the United States Coast Guard (USCG), Department of Homeland Security (DHS), Department of Energy (DOE), and other federal agencies for which protection from vehicle-based threats is important. Commercial security entities could likewise benefit from automated processing of imagery data. Federal, state and commercial rescue organizations could also benefit from the ability to track objects. All organizations, for which remote imagery is valuable, could potentially benefit from this technology.

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